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(54) APPARATUS FOR OBTAINING GROUND WATER FROM SOIL

(71) We ALOIS KOBER KG, a German KG, of D-8871 Kötz 2, Federal Republic of Germany do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to apparatus for obtaining ground water from the upper water-bearing regions in the soil, primarily to a depth of approximately 10 metres, by pumping which may be performed by means of a hand pump or motorised pump.

Small wells are widely known. Generally, an iron tube with a ramming point is inserted into the ground; water is then drawn in through the iron pipe by means of negative pressure. Such ramming wells, also known as Abyssinian wells, suffer from the disadvantage that it is not possible to known precisely the depth to which the ramming point is to penetrate so as to be in optimum contact, *via* a filter, with water-bearing stratum of the ground. The wells usually silt up rapidly because the entire system is associated with negative pressure. The manufacture of such wells is also expensive.

It is an object of the invention to provide apparatus for establishing a small well system, which is relatively inexpensive and whose suction region can be reliably introduced into water-bearing strata without the risk of silting up.

According to the invention there is provided apparatus for obtaining ground water from soil, comprising a tubular casing having at one end a bit for facilitating insertion into the ground, holes through the casing for passage of water from the soil into the interior of the casing, pumping means including a tubular part having at an end adjacent said one end of the casing a non-return valve, the space between the casing and the pumping means communicating with the atmosphere *via* vent means of the casing.

Thus using the invention it is possible to provide apparatus in which it is not possible for a negative pressure state, which was originally the cause of silting up of wells, to establish itself when water is obtained.

Owing to the special arangement of the pumping element within the apparatus or well casing the amount of water removed is always less than that contained in the well. Lowering of the water level in the casing does not lead to negative pressure because the cavity of the well casing communicates with atmosphere.

Ramming the well casing into the soil and to ensure adjustment of the well filter in the water bearing strata may be simplified in a well according to the invention.

Deformation of the well casing when this is driven into geologically harder strata may also be avoided.

Apparatus for obtaining ground water from water-bearing soil strata as hereinafter described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a side view, partially in section, of a small well;

Figure 2 is a longitudinal section, to a smaller scale than that of Figure 1, through the bottom region of a casing of the well of Figure 1; and

Figure 3 is a longitudinal section through a filter insert, again to a smaller scale than that of Figure 1.

Before the well is rammed into the soil it is advantageous to determine the location of the water-bearing stratum. To this end it is proposed that a rod, comprising a plurality of coupled components and having a groove extending along an external line, be driven into the soil. On withdrawing the rod from the soil it is possible to determine the depth and thickness of the water-bearing strata by

reference to the soil which remains in the groove. The bore hole left by the sounding probe is advantageously employed as the loction for ramming in the small well.

Referring to the drawings, the apparatus or well shown has a well casing 9 comprising individual tubular members (for example of 1 metre length) which are joined to each other by means of screwthreaded nuts or the like. The bottom end (as viewed) is provided with a filter region 10 indicated by numerous apertures 15 in the wall of the well casing 9. The filter region is joined to a drill bit 11. Guiding means 12, set at an angle to a longitudinal axis 16 of the casing 9, are provided on the drill bit 11. The arrangement of the guiding means 12 - in this case welded plate - ensures that ramming into the ground of the well casing 9 results in corresponding rotation (for example 2 to 5 rotations per metre) so that ramming into the soil is faeilitated.

The individual tubular members of the well casing 9 form a contiguous tube without transverse divisions.

A pump element 13, for example a plasties pipe, a plasties hose or the like is inside the well casing 9. At the bottom end (as viewed in Figure 1) of the hose or pipe there is provided a non-return valve 17 which also functions as a suction port. The cross-section of the space between the well casing 9 and the pump element 13 is greater by several factors than the internal cross-section of the pump element. If a suction action is produced in the upper region (shown diagrammatically), water, which is disposed in the space between the well casing 9 and the pumping element 13, can be drawn off without complication. Lowering of the water level in the space would, however, intrinsically produce negative pressure. This is avoided by the space communicating with atmosphere *via* an air vent 26, through which air can enter the space when the water level is lowered and can escape therefrom when the water level is raised, is provided on the part of the well casing 9 which covers the soil or projects thereabove. This provision of a bleed to atmosphere avoids the production of a negative pressure in the well casing 9 due to a lowering of the water level or excessively rapid removal of the water which would otherwise lead to powerful suction of the moisture in the soil and to the entrainment of sand or the like.

Even better removal of the water is obtained if suction is applied, for example in the drilling bit 11, because a laterally propagating negative pressure cannot form therein. However, a sleeve can be placed around the filter surface 10 of the well casing in the region of the suction action for the most powerful suction action.

It is advisable to employ seamless drawn tubing of high grade steel for the well casing 9.

Openings 15 for passage of water (Figure 2) are so arranged as to retain the overall mechanical strength of the casing 9. For example, the distance 25 between the openings 15 should correspond to at least the diameter of the openings 15.

Fabric 19 can be associated with the individual openings 15; it is convenient to employ a cylindrical mesh which is provided to bear closely upon the interior of the casing 9; the said mesh cylinder can be welded or soldered to one end of the casing 9. It can also be so welded or soldered to the opposite end (for example where the drill bit 11 is situated); this operation would be performed before the drill bit 11 is welded into position; or a mesh insert (Figure 3), comprising a cylindrical shell 21 is employed, the mesh 21 having a mesh size corresponding to that of the fabric 19. A disc 22 can be provided at the end. This must be selected so as to be a proper fit in relation to the internal diameter 24 of the casing 9. In other words the diameter 25 of the disc 22 is slightly smaller than the diameter 24 (see Figure 2) of the casing 9.

Advantageously the angle 27 that a line through adjacent openings 15 makes with the axis 16 of the filter 9 is 45°. However, any other alignment, preferably between 15° and 75° is also feasible.

In the embodiment, pumping is effected manually *via* a handle as shown in Figure 1.. Using the invention small wells can be established very rapidly with a minimum of cost.

WHAT WE CLAIM IS:-

1. Apparatus for obtaining ground water from soil, comprising a tubular casing having at one end a bit for facilitating insertion into the ground, holes through the casing for passage of water from the soil into the interior of the casing, pumping means including a tubular part having at an end adjacent said one end of the casing a non-return valve, the space between the casing and the pumping means communicating with the atmosphere *via* vent means of the casing.

2. Apparatus according to Claim 1, in which the bit has external guiding means inclined at an angle to the longitudinal axis of the easing.

3. Apparatus according to Claim 1 or Claims 2, in which the non-return valve is surrounded by a filter.

4. Apparatus according to any preceding Claim, in which the tubular part of the pumping means is comprised of plastics.

5. Apparatus according to any preceding Claim, including filter means covering the holes through the casing.

6. Apparatus according to Claim 5, in which the filter means lies along the internal surface of the casing.

7. Apparatus according to Claim 6, in whih the filter means covering the holes comprises a cylinder which bears in a sealing tight manner on the internal surface of the casing.

8. Apparatus according to any preceding Claim, in which the cross-section of the space between the casing and the tubular part of the pumping means is several times greater than the internal cross-section of the tubular part of the pumping means.

9. Apparatus according to any preceding Claims, in which the holes are aligned along an axis which extends at an angle in the range 15° to 75° to the longitudinal axis of the casing.

10. Apparatus for obtaining ground water from soil, substantially as hereinbefore described with reference to and as shown in Figures 1, 2 and 3 of the accompanying drawings.

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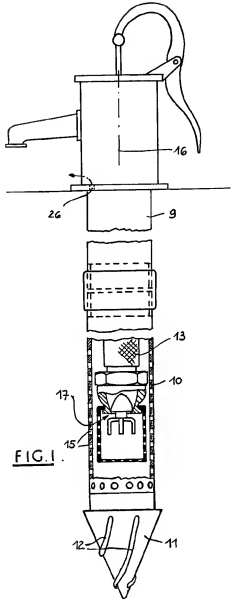

FIG. 1.

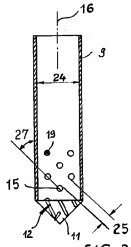

FIG. 2.

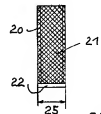

FIG. 3.